

5.5 Select a Mathematical Model

p. 320- 331

Identifying Models using the TI 83- Investigation
p.322

Testing a New Fertilizer

To test a new fertilizer, a biochemical company has planted several test hectares of corn. Individual hectares were sprayed with concentrations of 2%, 3%, 4%, and 5% solutions of the new fertilizer. Crop yields, in bushels per hectare, from each test planting are shown in the table.

Concentration (%)	Yield (bushels/ha)
2	600
3	650
4	691
5	721



- a) Create a scatter plot of the data.
- b) From your scatter plot, which model appears most appropriate: linear, quadratic, or exponential? Justify your answer.
- c) Generate a model for the data. Represent the model using a graph and an equation.
- d) Use the model to predict the effect of increasing the concentration of fertilizer by several more steps of 1%.
- e) Use your model to predict the concentration that will result in the maximum crop yield.

Mar 24-11:12 AM

Movie Soundtrack

Where is the mathematics in a movie? Films that seek to stir their audiences make use of unusual musical chord structures as part of the soundtrack. One of these chord structures is the augmented fifth chord. On a keyboard, such a chord can be demonstrated by simultaneously pressing the keys marked in red. What is the relation among these notes? The key numbers and frequencies, in hertz (Hz), are shown in the table.

Key Number	Frequency (Hz)
1	261.626
5	329.628
9	415.305
13	523.251



- a) Are the key number intervals constant?
- b) Calculate first differences, second differences, and ratios.
- c) Which model appears most suitable for the data: linear, quadratic, or exponential? Justify your answer.
- d) Create a scatter plot of the data.
- e) Generate a suitable model for the data. Represent the model graphically and algebraically.
- f) A more powerful effect can be created by adding more notes in the same augmented fifth pattern. Use the model to predict the next three key numbers and frequencies.

Apr 4-7:38 AM

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Apr 4-7:38 AM

Solutions

- b) The first differences, second differences, and ratios are shown.

Key Number	Frequency (Hz)	First Differences	Second Differences	Ratios
1	261.626			
5	329.628	68.002		
9	415.305	85.677	17.675	1.260
13	523.251	107.946	22.269	1.260

Apr 3-7:31 AM

Key Concepts

- Data can be modelled graphically or algebraically
- Models are used to make predictions (interpolations or extrapolations)
- If the first differences are constant, or almost constant then the model is linear
- If the second differences are the same then the model is quadratic
- If the ratios are the same, the model is exponential - constant percent increase
- If more than one model appears to fit, examine the r^2 value

Mar 21-12:30 PM

Hmk. p. 326 -330
q. 3-9 & 10*

Mar 8-7:37 AM